

25	3.2.2 Activities	25
26	3.2.3 Notes and Further Reading	26
26	3.3.1 What Goes Around Comes Around	27
27	3.3.1.1 Introduction	27
28	3.3.1.2 Activities	28
28	3.3.2 Notes and Further Reading	29
29	3.3.3 Hanging Out	30
30	3.4.1 Introduction	30
30	3.4.2 Activities	30

Contents

31	Will Get You There	31
32	Introduction	32
32	3.5.1 Introduction	32
33	3.5.2 Activities	33
33	3.5.3 Notes and Further Reading	34
34	3.6.1 Uncommonly Interesting	34
35	3.6.1.1 Introduction	35
36	3.6.2 Activities	36
36	3.6.3 Notes and Further Reading	37

INVERSE PROBLEMS IN DIFFERENT FACULTIES

1	1. INTRODUCTION TO INVERSE PROBLEMS	1
2	1.1 What Are Inverse Problems?	1
3	1.2 Archimedes' Bath	4
4	1.3 Tartaglia's Wager	7
5	1.4 Two Bodies	9
6	1.5 Another World	10
7	1.6 The Fountains of Dijon	12
8	1.7 The Universe	13
9	1.8 Got the Time?	15
10	1.9 The Underworld	17
11	1.10 Head Games	19
12	1.11 Why Teach Inverse Problems?	21
13	1.12 Notes and Suggestions for Further Reading	22

2. INVERSE PROBLEMS IN PRECALCULUS	25
2.1 A Little Squirt	25
2.1.1 Introduction	26
2.1.2 Activities	27
2.1.3 Notes and Further Reading	28
2.2 A Cheap Shot	28
2.2.1 Introduction	29
2.2.2 Activities	30
2.2.3 Notes and Further Reading	33
2.3 das Rheingold	33
2.3.1 Introduction	34
2.3.2 Activities	36
2.3.3 Notes and Further Reading	39
2.4 Splash Splash	39
2.4.1 Introduction	39
2.4.2 Activities	40
2.4.3 Notes and Further Reading	41
2.5 Snookered	41
2.5.1 Introduction	42
2.5.2 Activities	43
2.5.3 Notes and Further Reading	44
2.6 Goethe's Gondoliers	44
2.6.1 Introduction	45
2.6.2 Activities	46
2.6.3 Notes and Further Reading	48
3. INVERSE PROBLEMS IN CALCULUS	51
3.1 Strange Salami	52
3.1.1 Introduction	52
3.1.2 Activities	54
3.1.3 Notes and Further Reading	59
3.2 Shape Up!	59
3.2.1 Introduction	60

3.2.2	Activities	64
3.2.3	Notes and Further Reading	66
3.3	What Goes Around Comes Around	67
3.3.1	Introduction	67
3.3.2	Activities	73
3.3.3	Notes and Further Reading	76
3.4	Hanging Out	78
3.4.1	Introduction	78
3.4.2	Activities	80
3.4.3	Notes and Further Reading	83
3.5	Two Will Get You Three	84
3.5.1	Introduction	85
3.5.2	Activities	86
3.5.3	Notes and Further Reading	87
3.6	Uncommonly Interesting	87
3.6.1	Introduction	87
3.6.2	Activities	89
3.6.3	Notes and Further Reading	90
4. INVERSE PROBLEMS IN DIFFERENTIAL EQUATIONS		91
4.1	Stirred, Not Shaken	92
4.1.1	Introduction	92
4.1.2	Activities	93
4.1.3	Notes and Further Reading	96
4.2	Slip Sliding Away	96
4.2.1	Introduction	97
4.2.2	Activities	99
4.2.3	Notes and Further Reading	102
4.3	It's A Drag	102
4.3.1	Introduction	102
4.3.2	Activities	107
4.3.3	Notes and Further Reading	111
4.4	Ups and Downs	111
4.4.1	Introduction	111

4.4.2 Activities	114
4.4.3 Notes and Further Reading	117
4.5 A Hot Time	117
4.5.1 Introduction	118
4.5.2 Activities	121
4.5.3 Notes and Further Reading	126
4.6 Weird Weirs	126
4.6.1 Introduction	127
4.6.2 Activities	129
4.6.3 Notes and Further Reading	130
5. INVERSE PROBLEMS IN LINEAR ALGEBRA	133
5.1 Cause and Identity	134
5.1.1 Introduction	134
5.1.2 Activities	138
5.1.3 Notes and Further Reading	142
5.2 L'ART Pour L'Art	142
5.2.1 Introduction	142
5.2.2 Activities	146
5.2.3 Notes and Further Reading	148
5.3 Nonpolitical Pull	149
5.3.1 Introduction	149
5.3.2 Activities	153
5.3.3 Notes and Further Reading	155
5.4 A Whole Lotta Shakin' Goin' On	156
5.4.1 Introduction	156
5.4.2 Activities	160
5.4.3 Notes and Further Reading	163
5.5 Globs and Globs	163
5.5.1 Introduction	164
5.5.2 Activities	166
5.5.3 Notes and Further Reading	168

5.6	Tip Top	168
5.6.1	Introduction	168
5.6.2	Activities	174
5.6.3	Notes and Further Reading	176
APPENDIX A: SELECTED ANSWERS & ADVICE		177
A.1	Inverse Problems in Precalculus	177
A.1.1	A Little Squirt	177
A.1.2	A Cheap Shot	178
A.1.3	das Rheingold	179
A.1.4	Splish Splash	181
A.1.5	Snookered	182
A.1.6	Goethe's Gondoliers	182
A.2	Inverse Problems in Calculus	183
A.2.1	Strange Salami	183
A.2.2	Shape Up!	185
A.2.3	What Goes Around Comes Around	186
A.2.4	Hanging Out	188
A.2.5	Two Will Get You Three	189
A.2.6	Uncommonly Interesting	189
A.3	Inverse Problems in Differential Equations	189
A.3.1	Stirred, Not Shaken	189
A.3.2	Slip Sliding Away	190
A.3.3	It's a Drag	192
A.3.4	Ups and Downs	192
A.3.5	A Hot Time	193
A.3.6	Weird Weirs	193
A.4	Inverse Problems in Linear Algebra	193
A.4.1	Cause and Identity	193
A.4.2	L'ART Pour L'Art	194
A.4.3	Nonpolitical Pull	195
A.4.4	A Whole Lotta Shakin' Goin' On	195
A.4.5	Globs and Globs	196
A.4.6	Tip Top	196

APPENDIX B: MATLAB SCRIPTS	197
B.1 MATLAB Scripts	197
B.2 Contents	197
B.3 Calculus Scripts	198
B.3.1 Module 3.1	198
B.3.2 Module 3.2	199
B.3.3 Module 3.3	201
B.3.4 Module 3.6	202
B.4 Differential Equation Scripts	203
B.4.1 Module 4.3	203
B.4.2 Module 4.4	207
B.4.3 Module 4.5	209
B.4.4 Module 4.6	211
B.5 Linear Algebra Scripts	212
B.5.1 Module 5.2	212
B.5.2 Module 5.3	215
B.5.3 Module 5.5	216
BIBLIOGRAPHY	217
INDEX	219